QCD Events with large MET
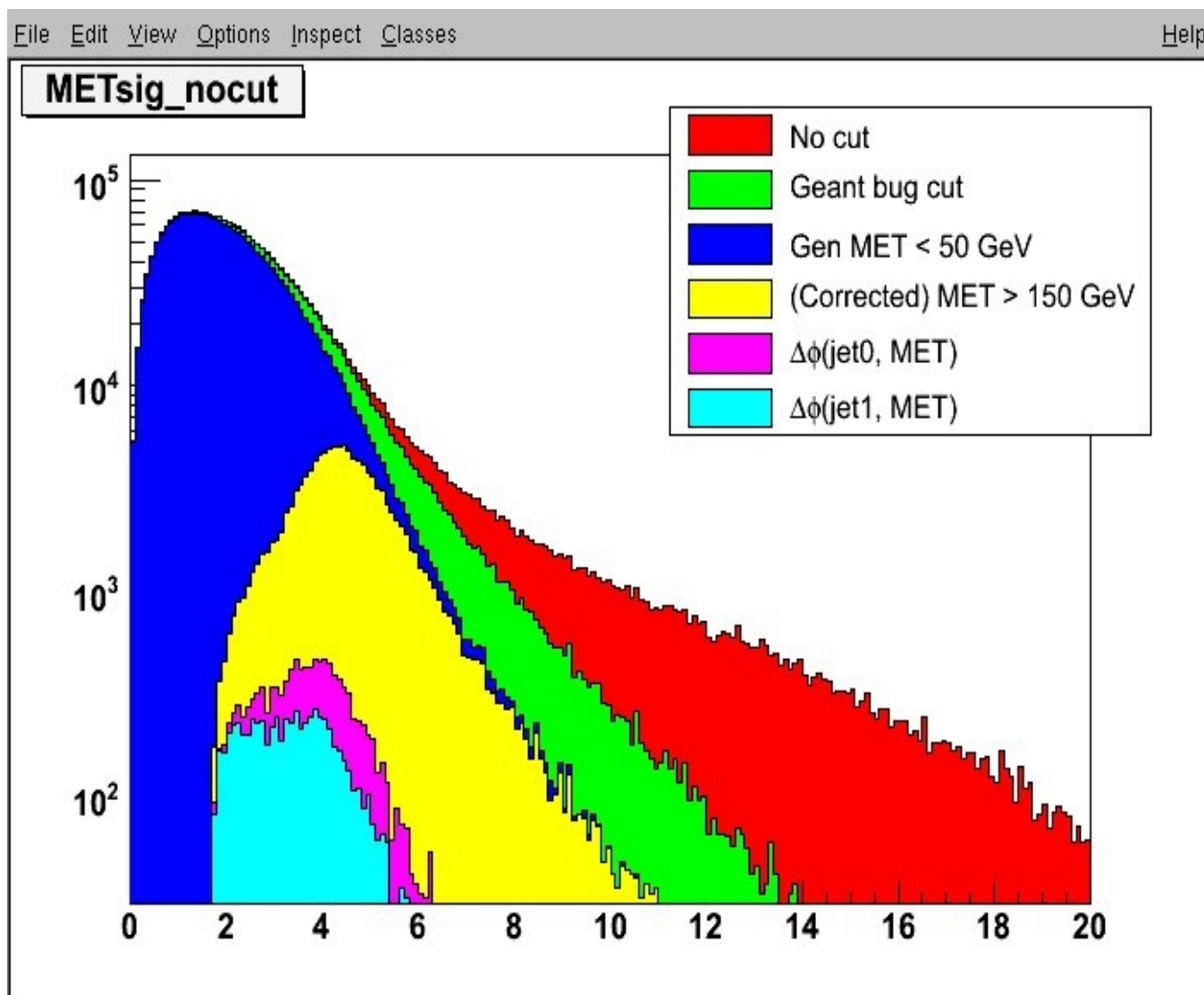
MET Cuts

- HighMET QCD sample

  - Cuts: <50 GeV genMet, > 150 GeV corrected MET

  - $|\Delta\phi(\text{jet0-MET})|<.349$, $\pi-|\Delta\phi(\text{jet0-MET})|<.349$

  - $|\Delta\phi(\text{jet1-MET})|<.349$, $\pi-|\Delta\phi(\text{jet1-MET})|<.349$

- Result: ~7k out of 1 million events pass cut

  - 50% of passing events contain GEANT bug!
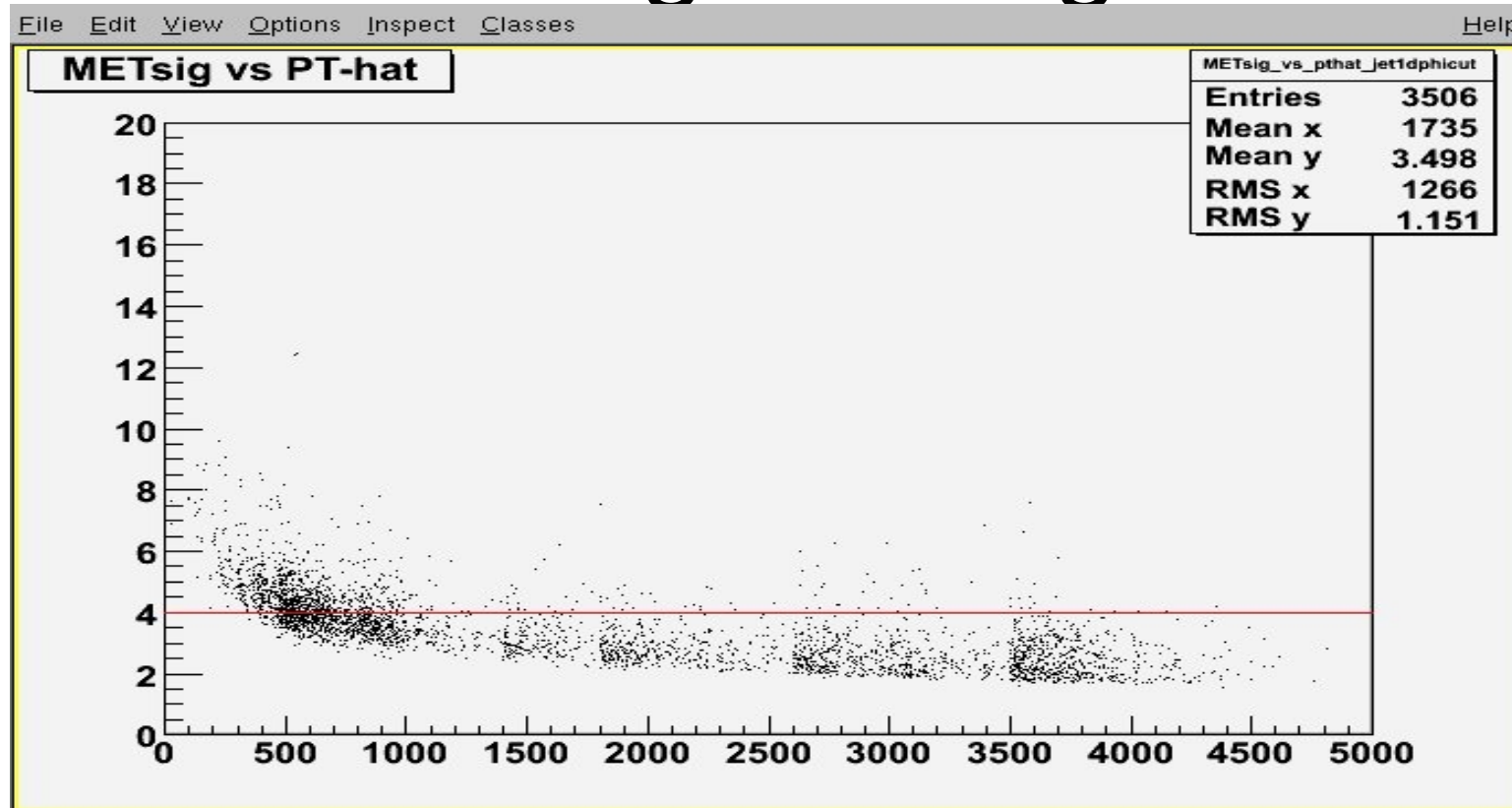
  - appears as poorly reco'd jets (reco ET $<<$ gen ET)

MET significance

Removing buggy events gets rid of all events with METsig>14, much of other high -METsig events

Put cut on METsig>4 in remaining sample

Adding METsig cut

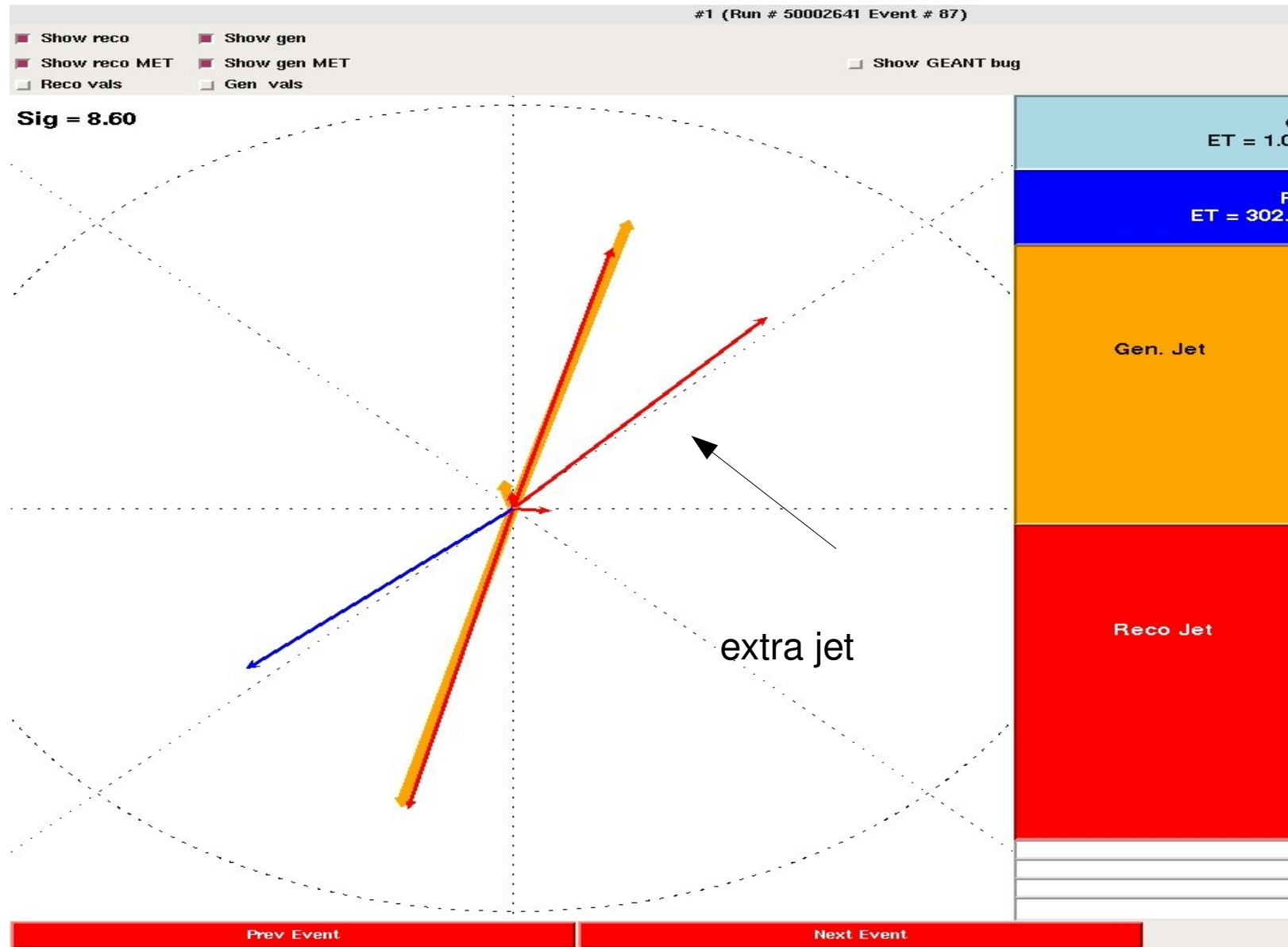

- Require METsig > 4

  – removes most of the high-pt events, where MET is solely due to resolution

  – ~1000 (out of >1Million) events pass all cuts
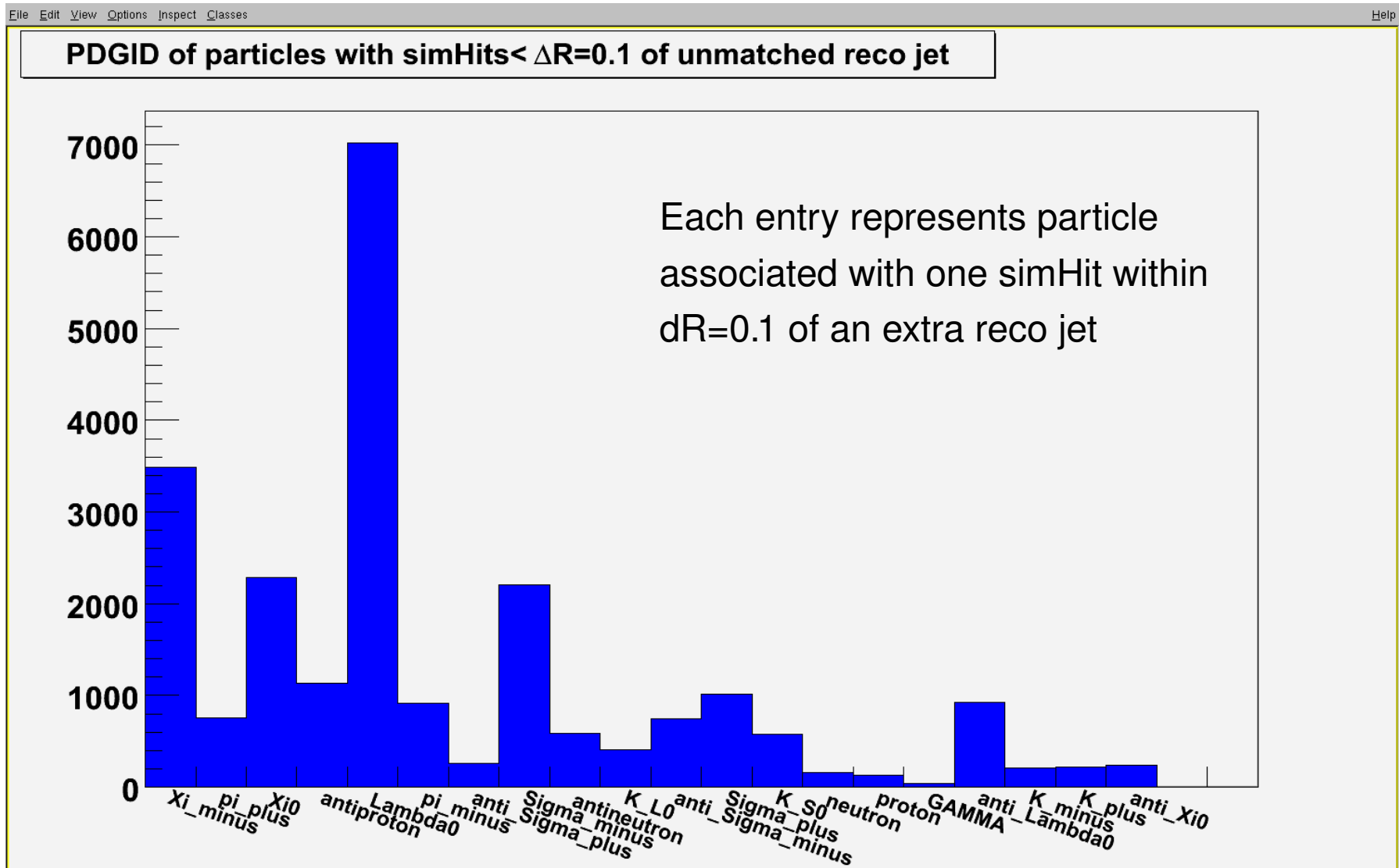
Categorize failures of remaining events

- Extra jet: reco jet>50 GeV not matched to gen jet within DeltaR<0.3

- Missing jet: no reco jet for a gen jet >50 GeV
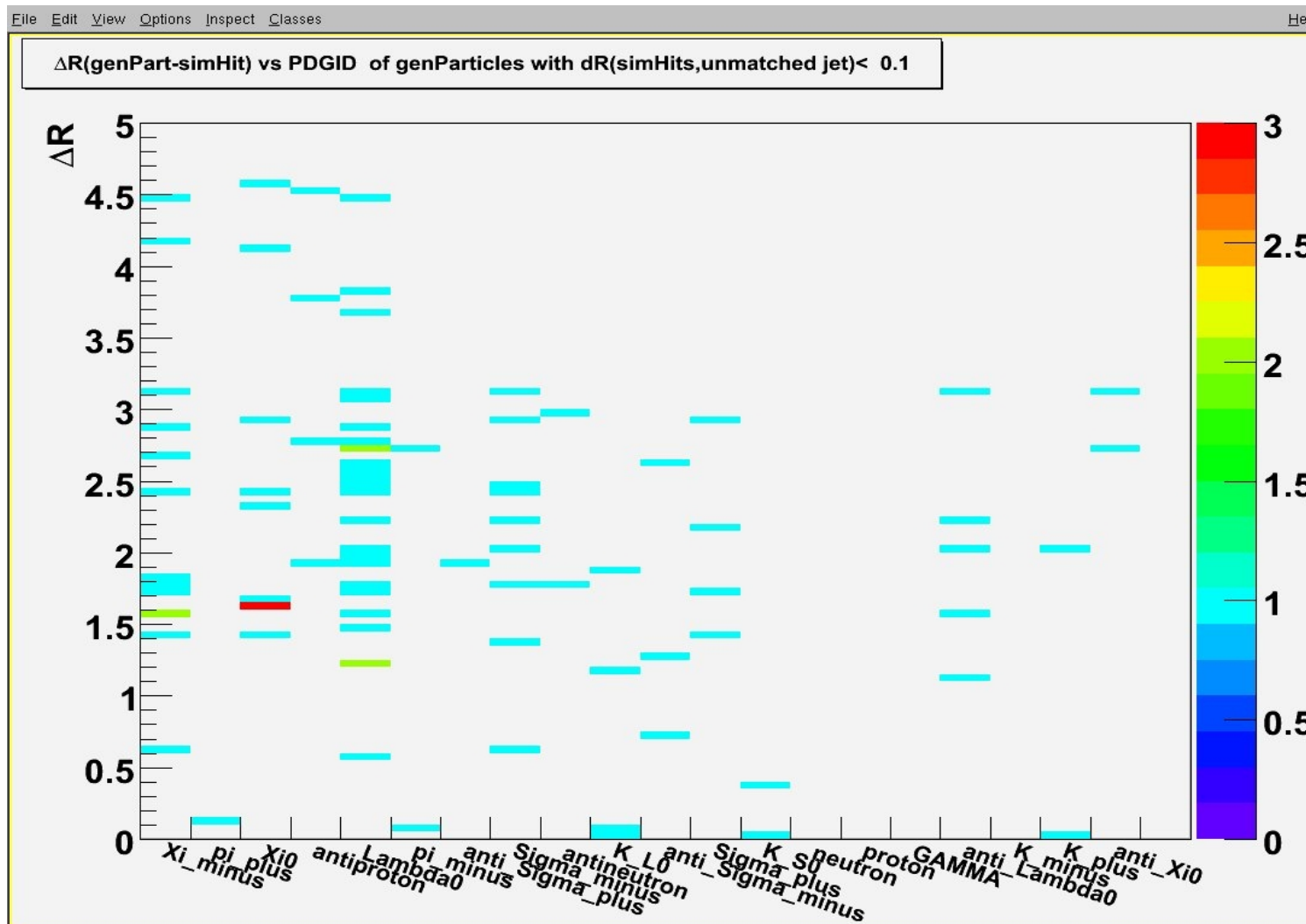
- Remaining events: look at reco-gen energies

Sample event with extra reco jet

extra jet
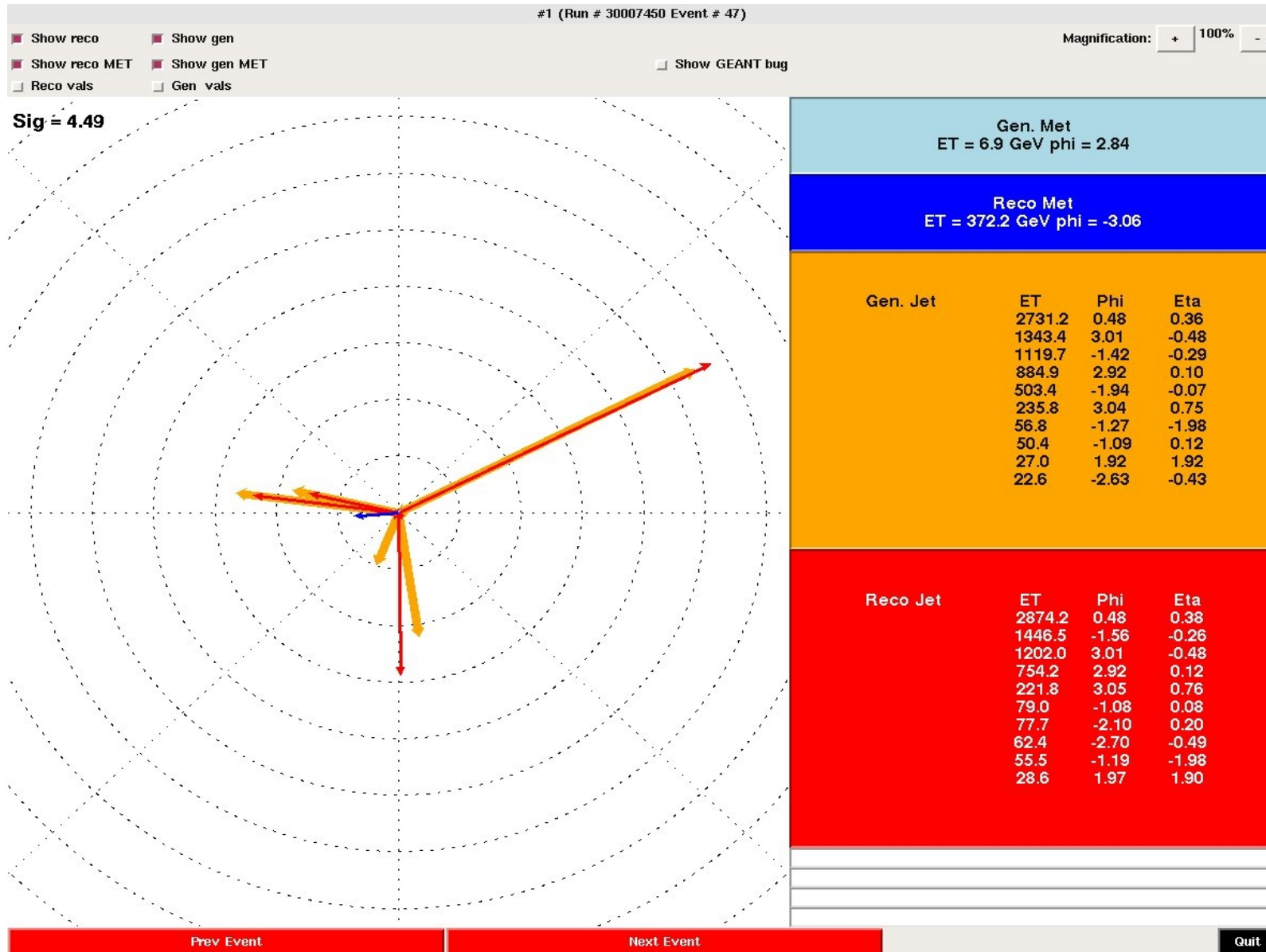
Look at SimHit-genParticle associations of extra jet

PDGID of particles with simHits< ΔR=0.1 of unmatched reco jet

Each entry represents particle associated with one simHit within dR=0.1 of an extra reco jet

Plot ID of particle with largest contribution to each extra jet energy

ΔR(genPart-simHit) vs PDGID of genParticles with dR(simHits,unmatched jet)< 0.1

Seems to be dominated by lambda, sigma, Xi

Another possible issue with late-decaying particles?

"Missing" jets

Gen jets without a reco jet match
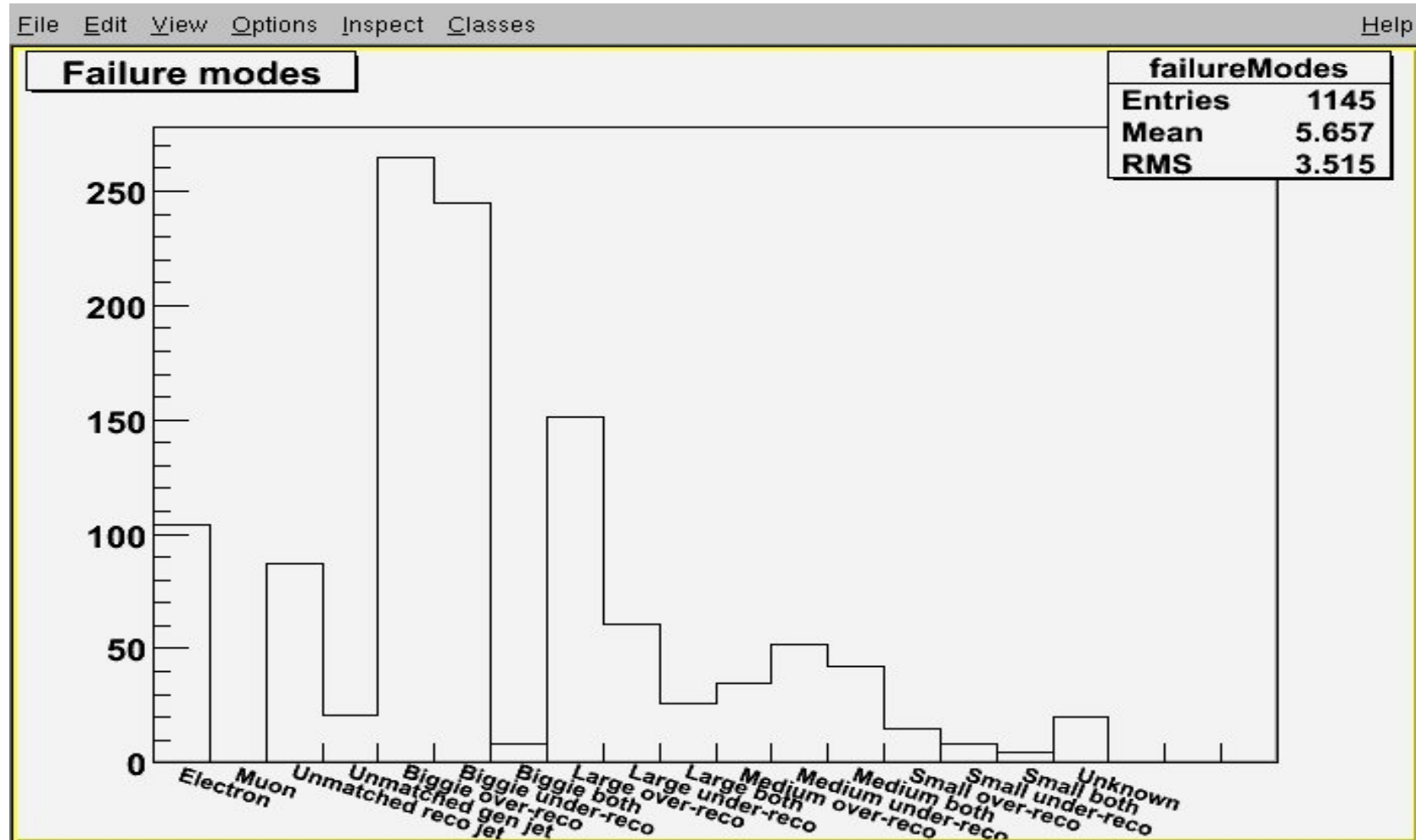
Jets aren't really missing;
Reco jet merges two gen jets

21 such events found
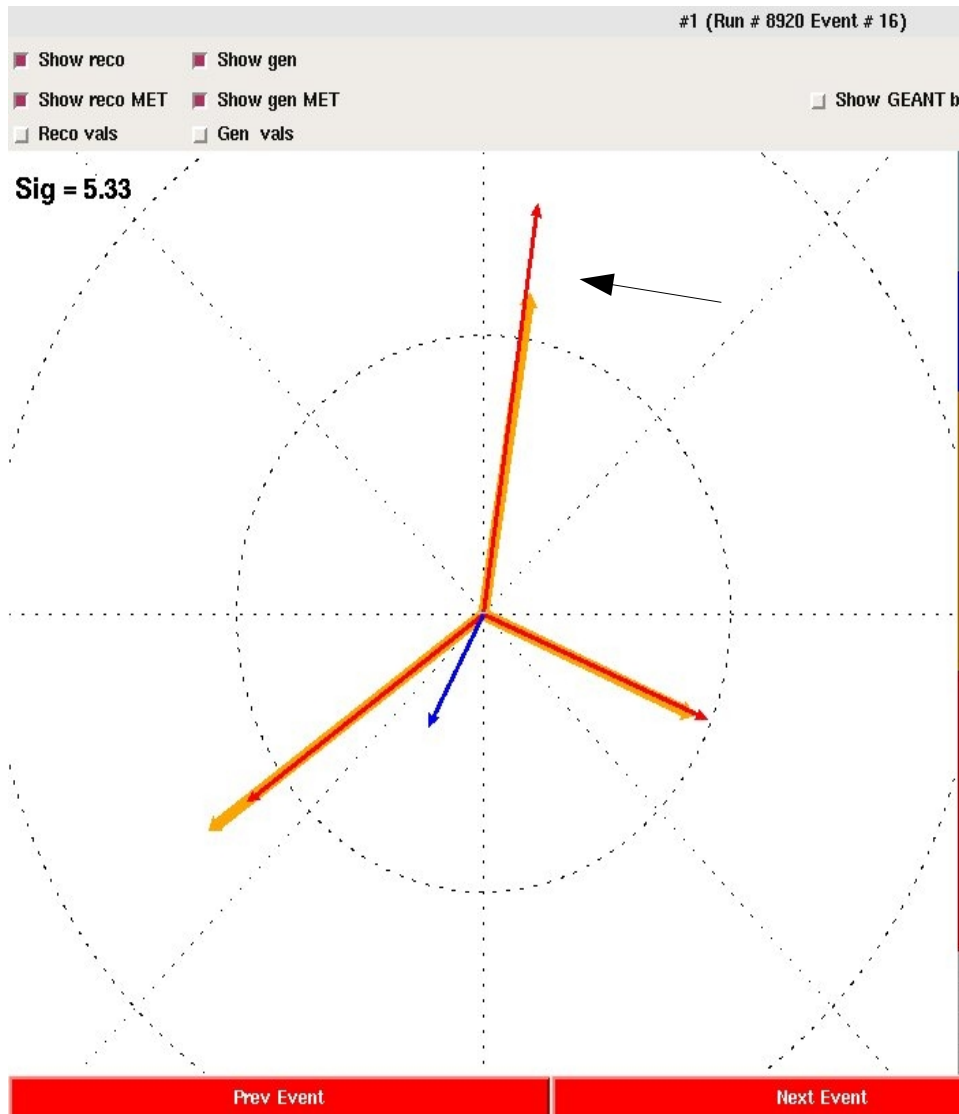
10 have minimal effect on MET

Other failure modes

- Reco jet resolution assumed to be 125% x sqrt(ET)

- Look at jets with (reco-gen) ET > 2 sigma

- Categorize jets by (reco-gen) ET difference, projected onto MET axis
    - >50 %: "Biggie"
    - > 37.5%: "Large"
    - > 25%: "Medium"
    - > 10%: "Small"

Types of MET "Failure Modes"

- electrons, muons plotted for curiosity's sake

  - no effect on MET

  - muon ID cuts tighter than electrons

Sample "Biggie" Failure

- One "biggie" difference between gen, reco jets

- Other jet differences shift MET direction

Still to discover...

- Is some bug causing the extra jet events?

- What about "unknown" events (don't fall into any other MET failure category)?

- What about events with large genMet? Why do we have these?